

REMARKS

Claims 1-18 were rejected under 35 U.S.C. §103(1) as being unpatentable over Vickerman (US 5,670,081) in view of Eckard et al. (US 6,225,267). The Examiner alleged that Vickerman disclosed the (A)(1) and (B)(1) elements of Applicant's claims along with the (C) component in the correct ratios. The Examiner alleges that Vickerman teaches the composition comprises sulfonates but does not recite the sulfonates are arene sulfonates. The Examiner alleges that Eckard teaches emulsifiers for use in metal working lubricants and teaches the emulsifiers can contain linear and branched alkyl aryl sulfonates in amounts from 30 to 50%. Then, the Examiner alleges that it would have been obvious for one skilled in the art to combine the alkyl aryl sulfonates of Eckard in the alkyl "sulfonated" emulsifier composition of Vickerman. I think it was a typo to specify alkyl "sulfonated" emulsifier of Vickerman as the Vickerman composition is a "carboxylate". Or, maybe the Examiner meant to substitute the alkyl aryl sulfonated of Eckard for the generic sulfonate (as an optional component) of Vickerman.

Applicant respectfully disagrees with the §103(a) rejection of claims 1-18 based on the combination of Vickerman and Eckard. Vickerman does teach Applicant's (A)(1), (B)(1) and (C) components. Eckard does teach a replacement for natural sodium sulfonates for use in metal working lubricants. However, Vickerman and Eckard are competing technologies for the same problem, i.e., looking for a replacement for natural sodium sulfonates (which due to change in refinery streams are becoming available in reduce quantities). As explained in the Background of the Invention in Eckard, refiners are producing less natural petroleum sulfonated so users in metalworking fluids are looking for other emulsifiers that perform similarly at similar prices. Both references were trying to find an inexpensive emulsifier for oil in water in commercially significant volumes to make metalworking lubricants from oil, water, and a few additives.

Natural sodium sulfonates have very broad molecular weight (and equivalent weight) distributions and this is believed to be a contributing factor in their ability to form and stabilized oil in water emulsions. Vickerman created a carboxylate-tertiary amine emulsifier with broad molecular weight distribution by coupling a low molecular weight polycarboxylic acylating agent with a much higher molecular weight polycarboxylic acylating agent. One could change the

average equivalent weight of the emulsifier by changing the ratio of the higher molecular weight component to the lower molecular weight component.

In Eckard, the inventors wanted to start with a low cost natural petroleum sulfonate that had not been extracted (non-extracted sulfonates) eliminating the extraction step saved a costly step and resulting in more material (less byproduct) from the sulfonation. This is explained in column 3, lines 6-20. But these non-extracted sulfonates have low concentration of sulfonated material (15-30% or 20-30% active in oil according to column 3, lines 13-14). Therefore, a more concentrated sulfonated needed to be added to get the total sulfonated material up to a reasonable 50 or 60% active in oil. The inventors in Eckard decided to use a blend of branched chain alkylaryl sulfonates and linear chain alkylaryl sulfonates. According to the specification (column 4, lines 10-11), the branched chain alkylaryl sulfonates give better solubility in oils and emulsion stability. According to the specification (column 4, lines 17-19), linear chain alkylaryl sulfonates decrease solubility and overall emulsion stability. According to the specification (column 5, lines 29-39), the molecular weights of the linear and branched alkylaryl sulfonates can be chosen so that the average equivalent weight of the sulfonates falls between 400 and 500 g/mole. The equivalent weight of the sulfonated blend can apparently have an effect on the emulsion performance and the corrosion protection of the metalworking fluid on the machined part.

After having read Eckard, it is apparent that one could control the branching versus linear portion of the Vickerman emulsifier and one could control the average equivalent weight of the Vickerman emulsifier by varying the ratio of the high molecular weight and low molecular weight acylating agents. Thus, there are not many variations with Eckard that are not already available with Vickerman. Thus, Applicant feels there is little or no motivation to combine the synthetic alkylaryl sulfonates (linear or branched) of Eckard with the emulsifier of Eckard to obtain synergy beyond emulsifier(s) of either reference alone (there are a lot of prior art emulsifiers for oil in water emulsions).

Applicant owns the Vickerman patent and optimized the emulsifier of Vickerman for use as an emulsifier for metalworking fluids. But, after a few batches, it was desired to create an even better emulsifier for metalworking fluids. So, starting with an optimized Vickerman emulsifier (optimized with respect to low molecular weight and high molecular weight acylating

agents, branching, equivalent weight, coupling moiety, counterion, and general performance), Applicant went through a trial and error screening of a variety of additives to the Vickerman emulsifier looking for additives that could a) ease the emulsion formation, b) make the emulsion more robust, c) make the emulsion less sensitive to hard water, d) make the emulsion corrosion inhibiting on machined parts, and/or e) make the emulsion less likely to generate undesirable foam. One material was found to be an improvement over 100% Vickerman emulsifier was a 60:40 blend of the Vickerman emulsifier with a C14-16 alkylbenzene sulfonated. While sulfonates are known to be a little less sensitive to hard water and to provide a little better inhibition of corrosion, other properties of the resulting emulsion were improved relative to 100% of the Vickerman composition. Thus, of the numerous possible additives to an oil in water emulsion stabilized by an emulsifier disclosed in Vickerman, Applicants found that synthetic alkylaryl sulfonates gave unexpected improvements.

If the Examiner is inclined to consider whether a combination of the Vickerman emulsifier with synthetic sulfonated alkylbenzene is patentable for metalworking applications, Applicant would be willing to run a limited number of comparisons illustrating benefits of the combination over either individually.

Applicant would like to point out the numerous combinations of Vickerman with other additives, Eckard with other additives, Vickerman with Eckard, or other combinations that were possible. One could add nonionic emulsifiers to either Vickerman or Eckard as nonionic emulsifiers have good hard water stability. One could add conventional water or oil soluble corrosion inhibitors to either Vickerman or Eckard or combinations thereof. One could add low molecular weight alkyl sulfonates because they are cheap and lower the surface tension more per gram than 400 equivalent weight alkylaryl emulsifiers. One could add defoamers to either composition.

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September 2, 2009
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Allowance of claims 1-18 is respectfully requested. If any additional fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to our Deposit Account No. 12-2275.

Enclosures: Request for three-month time extension

Respectfully submitted,
THE LUBRIZOL CORPORATION

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